CLAIMS

WE CLAIM

1. A secondary electrochemical cell capable of receiving a predetermined charge rate, comprising:

positive and negative terminals connected to a cathode and anode, respectively, for delivering power;

a can defining the positive and negative terminals and containing the cathode and anode; and

a label surrounding an outer periphery of the can having a first resistance; and

a band made from an ink that is printed onto the label at a predetermined location, wherein the band has a resistance within a predetermined range.

2. The cell as recited in claim 1, wherein the band has a second resistance less than the first resistance.

3. The cell as recited in claim 2, wherein the second resistance is between 1 kΩ and 100 kΩ.

4. The cell as recited in claim 3, wherein the first resistance is greater than 500 kΩ.

5. The cell as recited in claim 1, further comprising a switch that opens the connection between the positive electrode and the positive terminal when an internal cell pressure exceeds a predetermined level.

6. The cell as recited in claim 1, further comprising an abrasion-resistant layer surrounding the band.

7. The cell as recited in claim 1, wherein the band is printed using a conductive ink.

8. The cell as recited in claim 1, wherein the band is printed using a conductive carbon ink.

9. The cell as recited in claim 1, wherein the band is from the group consisting of PD-34 and SS24600.

10. The cell as recited in claim 8, wherein the band comprises a layer having mixed conductive carbon inks.

11. The cell as recited in claim 2, wherein the second resistance is between 1 kΩ and 250 kΩ.

12. The cell as recited in claim 9, wherein the band comprises a layer having mixed PD-34 and SS24600.

13. The cell as recited in claim 7, wherein the band comprises separate stacked layers of conductive inks.

14. The cell as recited in claim 8, wherein the band comprises separate stacked layers of conductive carbon inks.

15. The cell as recited in claim 7, wherein the band comprises separate stacked layers of PD-34 and SS24600.

16. The cell as recited in claim 1, further comprising one of a NiMH cell, an alkaline cell, a Lithium Ion cell, and a lead acid cell.

17. The cell as recited in claim 1, wherein the band is disposed proximal the negative end of the cell.

18. A secondary electrochemical cell capable of receiving a predetermined charge rate, comprising:

positive and negative terminals connected to a cathode and anode, respectively, for delivering power;

a can defining the positive and negative terminals and containing the cathode and anode; and

a label surrounding an outer periphery of the can having a first resistance, wherein the label includes a band disposed at a predetermined location on the band, wherein the band has a second resistance between 1 kΩ and 100 kΩ.

19. The cell as recited in claim 18, wherein the first resistance is greater than 500 kΩ.

20. The cell as recited in claim 18, further comprising a switch that opens the connection between the positive electrode and the positive terminal when an internal cell pressure exceeds a predetermined level.

21. The cell as recited in claim 16, further comprising an abrasion-resistant layer surrounding the band.

22. The cell as recited in claim 18, wherein the band is printed using a conductive ink.

23. The cell as recited in claim 18, wherein the band is printed using a conductive carbon ink.

24. The cell as recited in claim 18, wherein the band is from the group consisting of PD-34 and SS24600.

25. The cell as recited in claim 18, wherein the band comprises a layer having mixed conductive inks.

26. The cell as recited in claim 18, wherein the band comprises a layer having mixed conductive carbon inks.

27. The cell as recited in claim 18, wherein the band comprises a layer having mixed PD-34 and SS24600.

28. The cell as recited in claim 18, wherein the band comprises separate stacked layers of conductive inks.

29. The cell as recited in claim 18, wherein the band comprises separate stacked layers of conductive carbon inks.

30. The cell as recited in claim 18, wherein the band comprises separate stacked layers of PD-34 and SS24600.

31. The cell as recited in claim 18, further comprising one of a NiMH cell, an alkaline cell, a Lithium Ion cell, and a lead acid cell.

32. The cell as recited in claim 18, wherein the band is disposed proximal the negative end of the cell.

33. The cell as recited in claim 18, wherein the band surrounds the label.

34. A secondary electrochemical cell capable of receiving a predetermined charge rate, comprising:

positive and negative terminals connected to a cathode and anode, respectively, for delivering power;

a can defining the positive and negative terminals and containing the cathode and anode; and

a label surrounding an outer periphery of the can having a first resistance, wherein the label includes a band disposed on the label at a predetermined location, and wherein the band has a resistance within a predetermined range that identifies the cell as containing an internal pressure-responsive switch that terminates the connection between the positive terminal and the positive electrode when an internal cell pressure level exceeds a predetermined threshold.

35. The cell as recited in claim 34, configured to receive a charge current greater than 4 Amps.

36. The cell as recited in claim 34, further comprising an abrasion-resistant layer surrounding the band.

37. The cell as recited in claim 34, wherein the band is selected from the group consisting of PD-34 and SS24600.

38. The cell as recited in claim 37, wherein the band comprises a layer having mixed PD-34 and SS24600.

39. The cell as recited in claim 37, wherein the band comprises separate stacked layers of PD-34 and SS24600.

40. The cell as recited in claim 39, further comprising one of a NiMH cell, an alkaline cell, a Lithium Ion cell, and a lead acid cell.

41. The cell as recited in claim 34, wherein the band is disposed proximal the negative end of the cell.

42. A secondary cell charging apparatus that discriminates between properties of electrochemical cells, the charger comprising;

at least one cell cavity containing positive and negative charging contacts configured to engage a corresponding positive and negative contact of an electrochemical cell;

a pair of adjacent depressable resistance sensing contacts having first ends connected to electronic circuitry and second ends extending into the cell cavity at a predetermined location for engaging an outer surface of the electrochemical cell; and

wherein the electronic circuitry delivers a charge to the electrochemical cell based on a sensed resistance between the sensing contacts.

43. The charging apparatus as recited in claim 42, wherein the electronic circuitry applies a charge to the electrochemical cell at a rate that is determined by a resistance measured across the resistance sensing contacts.

44. The charging apparatus as recited in claim 43, wherein the electronic circuitry applies a charge between 4 and 15 Amps when the sensed resistance corresponds to a secondary cell having internal pressure-abating mechanism.

45. The charging apparatus as recited in claim 42, further comprising a thermistor located in the cell cavity for measuring a cell cavity temperature.

46. The charging apparatus as recited in claim 42, further comprising an air mover for delivering ambient air to the cell cavity.

47. The charging apparatus as recited in claim 42, wherein the electronic circuitry applies a constant current charge to the electrochemical cell.

48. The charging apparatus as recited in claim 42, wherein the electronic circuitry applies a constant voltage charge to the electrochemical cell.

49. The charging apparatus as recited in claim 48, wherein the charge is terminated when the sensed charging current falls below a predetermined threshold.

50. A secondary electrochemical cell charging system comprising:

a charging apparatus including 1) at least one cell cavity containing positive and negative charging contacts, and 2) a pair of adjacent resistance sensing contacts having first ends connected to electronic circuitry and second ends extending into the cell cavity at a predetermined location;

a secondary cell disposed in the cell cavity, wherein the cell includes 1) positive and negative terminals connected to a cathode and anode, respectively, for delivering power, 2) a can defining the positive and negative terminals and containing the cathode

and anode, 3) a label surrounding an outer periphery of the can having a first resistance, and 4) a band made from an ink that is printed onto the label at a predetermined location that is engaged by the resistance sensing contacts, wherein the band has a predetermined resistance, and wherein the cell is disposed in the charging cavity such that the positive and negative terminals engage the corresponding positive and negative charge contacts;

wherein the electronic circuitry applies a charge to the cell based on the resistance sensed between the resistance sensing contacts.

51. The charging system as recited in claim 50, wherein the cell further comprises a switch that disconnects the cathode from the positive terminal when internal cell pressure exceeds a predetermined threshold.

52. The charging system as recited in claim 51, wherein the charger applies a charge between 4 and 15 Amps to the cell.

53. The charging system as recited in claim 50, wherein the charger applies a charge to the cell between 4 and 15 Amps when the sensed resistance is between 1 kΩ and 100 kΩ.

54. The charging system as recited in claim 50, wherein the charger applies a charge to the cell less than 4 Amps when the sensed resistance is greater than 50 kΩ.

55. The charging system as recited in claim 50, wherein the charger applies a charge to the cell less than 4 Amps when the sensed resistance is greater than 100 kΩ.

56. The charging system as recited in claim 50, wherein the charger applies a charge to the cell less than 4 Amps when the sensed resistance is greater than 250 kΩ.

57. The charging system as recited in claim 50, wherein the charger applies a charge to the cell less than 4 Amps when the sensed resistance is less than 1 kΩ.

58. The charging system as recited in claim 50, wherein the charger applies no charge to the cell when the sensed resistance is less than 1 kΩ.

59. The charging system as recited in claim 50, wherein the resistance sensing contacts are depressed with a force of at least 100g when the cell is installed into the cavity.

60. The charging system as recited in claim 50, wherein the electronic circuitry applies a constant current charge to the cell.

61. The charging system as recited in claim 50, wherein the electronic circuitry applies a constant voltage charge to the cell.

62. The charging system as recited in claim 50, wherein multiple cells disposed in corresponding cell cavities are connected in parallel.

63. A method for discriminating between cell types at a secondary cell charger of the type including 1) a cell cavity, 2) electronic circuitry, 3) positive and negative charge contacts, and 4) resistance sensing contacts extending into the cell cavity and in electrical communication with the electronic circuitry, the steps comprising:

(A) inserting an electrochemical cell into the cell cavity such that the resistance sensing contacts engage an outer cell surface at a predetermined location;

(B) measuring a resistance across the resistance sensing contacts;

(C) determining whether the resistance is within the range of 1 and 100 kΩ;

(D) if the measured resistance is within the range of 1 and 100 kΩ, apply a first predetermined charge to the cell.

64. The method as recited in claim 63, further comprising the step of measuring a voltage across positive and negative cell terminals, and applying the charge of step (D) only if the measured voltage is greater than a nominal value.

65. The method as recited in claim 64, wherein the cell includes a pressure responsive switch that terminates contact between a cell cathode and a cell positive terminal, and wherein step (D) further comprises applying the first predetermined charge until the switch terminates contact or a predetermined length of time has elapsed.

66. The method as recited in claim 65, wherein the predetermined length of time is fifteen minutes.

67. The method as recited in claim 65, wherein a second predetermined charge is applied to the cell after the first predetermined charge is completed.

68. The method as recited in claim 67, wherein the second predetermined charge is less than 500 mAmps.

69. The method as recited in claim 67, wherein the second predetermined charge is applied for a predetermined length of time.

70. The method as recited in claim 69, wherein a third predetermined charge is applied to the cell after the second predetermined charge is completed.

71. The method as recited in claim 70, wherein the third predetermined charge is less than 100 mAmps.

72. The method as recited in claim 63, wherein the sensed resistance is not in the range of 1 and 100 kΩ, further comprising the step of determining whether a voltage across cell positive and negative terminals is greater than a nominal value.

73. The method as recited in claim 72, wherein no charge is applied to the cell if the voltage is not greater than the nominal value.

74. The method as recited in claim 72, further comprising applying a charge less than 4 Amps to the cell if the voltage is greater than the nominal value.

76. The method as recited in claim 63, wherein the charger further includes a battery presence circuit that is opened when the cell is inserted into the cavity, the method further comprising detecting the presence of the cell prior to step (B).

77. A method for discriminating between cell types at a secondary cell charger of the type including 1) a cell cavity, 2) electronic circuitry, 3) positive and negative charge contacts, and 4) resistance sensing contacts extending into the cell cavity and in electrical communication with the electronic circuitry, the steps comprising:

(A) inserting an electrochemical cell into the cell cavity such that the resistance sensing contacts engage an outer cell surface at a predetermined location;

(B) measuring a resistance across the resistance sensing contacts;

(C) determining whether the resistance is within a predetermined range;

(D) If the resistance is within the predetermined range, apply a charge to the cell within the range of 4 and 15 Amps.